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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/562,740	06/05/2006	Donald Borthwick	2003P07721WOUS	3839

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EXAMINER	
VERDIER, CHRISTOPHER M	
ART UNIT	PAPER NUMBER
3745	
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09/16/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/562,740	BORTHWICK ET AL.	
	Examiner	Art Unit	
	Christopher Verdier	3745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 March 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *21-40* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *21-40* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *26 March 2009* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

Applicant's Amendment dated March 26, 2009 has been carefully considered but is non-persuasive. The Replacement Sheets of Drawings filed March 26, 2009 are acceptable. The claims have been amended to overcome the informalities set forth in the first Office action. The claims have been amended to overcome the rejections under 35 USC 112, second paragraph set forth in the first Office action. Correction of these matters is noted with appreciation.

Applicant has disagreed with the statement in the Office action that negative sweep results in the direction of flow being rotated in a mathematically negative direction in order to achieve a coincidence of the direction of flow with respect to the instantaneous tangent of the blade surface, arguing that negative sweep is properly construed by the teachings of the specification as a whole in view of those of ordinary skilled in the art. This argument is not persuasive, because the designation of whether a sweep angle is considered to be negative or positive is an arbitrary mathematical sign convention.

Applicant has argued that Lings does not disclose both the rotor side and the stator side ends each respectively having a negative sweep angle, and requests a showing of where in Lings or how in Lings the values of the sweep angles have been determined. As set forth in the first Office action, the rotor-side end negative sweep is about 68 degrees and the stator-side end negative sweep is about 50 degrees. These are measured from figure 1 by forming a tangent at the rotor-side end and measuring the angle formed by this tangent with line 3-3, and forming a tangent at the stator-side end and measuring the angle formed by this tangent with line 3-3, the angles measured between the exterior of the blade surface and the line 3-3.

Applicant has argued that Liu does not disclose blades with a negative sweep angle, but rather blades without sweep. Applicant has requested identification where in Liu or how the rotor-side end negative sweep is and the stator-side end negative sweep are about 88 degrees. As seen in figure 2 of Liu, these are measured from figure 2 by forming a tangent at the rotor-side end and measuring the angle formed by this tangent with line 48, and forming a tangent at the stator-side end and measuring the angle formed by this tangent with line 48, the angles measured between the exterior of the blade surface and the line 48. Applicant has also argued that Liu does not disclose that the stator-side end is inclined with respect to the fluid flow direction as recited in claim 32. This argument is not persuasive, because as set forth above, the stator-side end near 46 (figures 2 and 3) is inclined with respect to the fluid flow direction 24.

Applicant has argued that Bessay does not disclose a turbine blade having both the rotor-side and the stator-side ends each respectively with a negative sweep angle. Applicant has requested identification where in Bessay or how the rotor-side end negative sweep is and the stator-side end negative sweep are about 85 degrees. As measured in figure 1 of Bessay, the surface 2 of the blade 1 forms a rotor-side end negative sweep angle and a stator-side end negative sweep relative to the flow direction arrow of about 85 degrees, measured between the exterior of the blade surface and the flow direction arrow.

Applicant has argued that Sato does not disclose a turbine blade having both the rotor-side and the stator-side ends each respectively with a negative sweep angle. Applicant has

requested identification where in Sato or how the rotor-side end negative sweep is and the stator-side end negative sweep are about 85 degrees. As measured in figure 1 of Sato, the surface 1a of the blade forms a rotor-side end negative sweep angle and a stator-side end negative sweep relative to the flow direction arrow of about 85 degrees, measured between the exterior of the blade surface and the flow direction arrow (the lowest flow line joining segment A-D in figure 1). Applicant has also argued that Sato does not disclose that the stator side end is inclined with respect to the fluid flow direction. This argument is not persuasive, because the stator-side end near 5 is inclined with respect to the fluid flow direction through the turbine.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 21-31 and 35-36 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 21, line 3, "a stationary stator cylinder" is a double recitation of the stationary cylinder in claim 21, line 2. In claim 21, line 4, "an axial rotor" is a double recitation of the rotor in claim 21, line 2. In claim 35, line 4, "the auxiliary tangent" is unclear as to what this is relative to.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 21-29, as far as they are definite and understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Lings 4,504,189. Disclosed is a turbine blade 16, comprising a stator-side end near 18 located toward an unnumbered stationary stator cylinder of a turbine engine, a rotor-side end near 17 located toward a rotatably supported axial rotor 15 of the turbine engine, an unnumbered leading edge located between the stator-side end and the rotor-side end, and a trailing edge 24 located between the stator-side end and the rotor-side end and located down-stream of the leading edge with respect to a fluid flow direction, wherein both the rotor-side and stator-side ends each respectively have a negative sweep angle as measured between the instantaneous tangent of the blade surface and the fluid flow direction. Negative sweep results in the direction of flow being rotated in a mathematically negative direction in order to achieve a coincidence of the direction of flow with respect to the instantaneous tangent of the blade surface. The negative sweep angle of the rotor-side and stator-side ends transition into a positive sweep in a region between the leading edge and trailing edge, near line 3-3. The rotor-side end negative sweep is about 68 degrees. The stator-side end negative sweep is about 50 degrees. The turbine blade is a stationary guide blade. The leading edge is arranged in front of the trailing edge in the axial direction of flow at the stator-side end and the rotor-side end. The turbine blade is arranged in a turbomachine.

Claims 21-22, 24, 26-29, 32-33, 35, and 37-38 (as far as claims 21-22, 24, 26-29, and 35 are definite and understood) are rejected under 35 U.S.C. 102(b) as being anticipated by Liu 2002/0141863 (figures 1-5). Disclosed is a turbine blade 30, comprising a stator-side end near 46 located toward a stationary stator cylinder 28 of a turbine engine, a rotor-side end near 44 located toward a rotatably supported axial rotor 20/22/32 of the turbine engine, a leading edge 40 located between the stator-side end and the rotor-side end, and a trailing edge 42 located between the stator-side end and the rotor-side end and located down-stream of a leading edge of the blade with respect to a fluid flow direction 24, wherein both the rotor-side and stator-side ends each respectively have a negative sweep angle as measured between the instantaneous tangent of the blade surface and the fluid flow direction. Negative sweep results in the direction of flow being rotated in a mathematically negative direction in order to achieve a coincidence of the direction of flow with respect to the instantaneous tangent of the blade surface. The rotor-side end negative sweep is about 88 degrees. The stator-side end negative sweep is about 88 degrees. The turbine blade is a stationary guide blade. The leading edge is arranged in front of the trailing edge in the axial direction of flow at the stator-side end and the rotor-side end. The turbine blade is arranged in a turbomachine. A delivery side 36 is located between the stator-side end and the rotor-side end, and a suction side 38 is located between the stator-side end and the rotor-side end and located down-stream of the leading edge with respect to the fluid flow direction, wherein the rotor-side end is inclined toward the delivery side and the stator-side end is inclined with respect to the fluid flow direction. The stator side end is inclined at an angle of about 88 degrees. The rotor-side end is inclined with respect to the fluid flow direction at an angle of about 88 degrees. The rotor-side end is inclined at about a 65 degree angle between the stacking axis 50 and a

tangent to the rotor side inner as seen in figure 3. Blade 30 is considered to be a turbine blade since it is located in a gas turbine engine.

Claims 21-22, 24, and 26-31, as far as they are definite and understood, are rejected under 35 U.S.C. 102(b) as being anticipated by Bessay 4,500,256 (figure 1). Disclosed is a turbine blade (stationary blades 1 or the unnumbered rotating blades attached to rotor 3), comprising a stator-side end near 4 located toward a stationary stator cylinder 4 of a turbine engine, a rotor-side end near 3 located toward a rotatably supported axial rotor 3 of the turbine engine, a leading edge (to the left) located between the stator-side end and the rotor-side end, and a trailing edge (to the right) located between the stator-side end and the rotor-side end and located down-stream of the leading edge with respect to a fluid flow direction shown by the arrow, wherein both the rotor-side and stator-side ends each respectively have a negative sweep angle as measured between the instantaneous tangent of the blade surface and the fluid flow direction. Negative sweep results in the direction of flow being rotated in a mathematically negative direction in order to achieve a coincidence of the direction of flow with respect to the instantaneous tangent of the blade surface. The rotor-side end negative sweep for a stator blade is about 85 degrees. The stator-side end negative sweep for a stator blade is about 85 degrees. The turbine blade is a stationary guide blade or a rotating blade. The leading edge is arranged in front of the trailing edge in the axial direction of flow at the stator-side end and the rotor-side end. The turbine blade is arranged in a turbomachine. A second up-stream turbine guide blade is located at a constant axial distance from a rotating turbine blade. A trailing edge of the second

up-stream guide blade is located at a constant axial distance from the leading edge of the rotating blade at the rotor-side end.

Claims 21-22, 24, 26-31, 32-33, 35, and 37-40 (as far as claims 21-22, 24, 26-31, and 35 are definite and understood) are rejected under 35 U.S.C. 102(b) as being anticipated by Sato 5,249,922 (figures 1-3, 8-9, and 10b-10c). Disclosed is a turbine blade 1 or 2, comprising a stator-side end near 5 located toward a stationary stator cylinder 5 of a turbine engine, a rotor-side end near D located toward a rotatably supported axial rotor 2 of the turbine, a leading edge 1a located between the stator-side end and the rotor-side end, and a trailing edge 1b located between the stator-side end and the rotor-side end and located down-stream of the leading edge with respect to a fluid flow direction, wherein both the rotor-side and stator-side ends each respectively have a negative sweep angle as measured between the instantaneous tangent of the blade surface and the fluid flow direction. Negative sweep results in the direction of flow being rotated in a mathematically negative direction in order to achieve a coincidence of the direction of flow with respect to the instantaneous tangent of the blade surface. The rotor-side end negative sweep for a stator blade is about 85 degrees. The stator-side end negative sweep for a stator blade is about 85 degrees. The turbine blade is a stationary guide blade 1 or a rotating blade 2. The leading edge is arranged in front of the trailing edge in the axial direction of flow at the stator-side end and the rotor-side end. The turbine blade is arranged in a turbomachine. Concerning claims 30-31 and 39-40, in figures 8-9 and 10b-10c, a second up-stream turbine guide blade 1 is located at a constant axial distance from a rotating turbine blade 2. A trailing edge of the second up-stream guide blade is located at a constant axial distance from the leading

edge of the rotating blade at the rotor-side end. A concave delivery side (see figures 1-3) of blade 1 is located between the stator-side end and the rotor-side end, and a convex suction side of blade 1 is located between the stator-side end and the rotor-side end and located down-stream of the leading edge with respect to the fluid flow direction, wherein the rotor-side end is inclined toward the delivery side and the stator-side end is inclined with respect to the fluid flow direction. The stator side end is inclined at an angle of about 85 degrees. The rotor-side end is inclined with respect to the fluid flow direction at an angle of about 85 degrees. The rotor-side end is inclined at about a 65 degree angle between the leading edge and a tangent to the rotor side inner as seen in figure 2 (formed between the rightmost line of angle γRi and the tangent to the rotor side inner).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claim 34 is rejected under 35 U.S.C. 103(a) as being unpatentable over Sato 5,249,922. Sato (figures 1-3) disclose a turbine blade 1 substantially as claimed as set forth above, including the stator-side end inclined at an angle of about 85 degrees, but does not disclose that the angle of inclination is 70 degrees.

The recitation of the angle of inclination of the stator-side end relative to the fluid flow direction being 70 degrees is a matter of choice in design. The angle of inclination of the stator-side end relative to the fluid flow direction of a turbine blade is a result-effective variable which influences the turbine efficiency and performance. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the angle of inclination of the stator-side end relative to the fluid flow direction in the turbine of Sato to be a specific value, such as 70 degrees, for the purpose of optimizing the turbine efficiency and performance, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Claim 36, as far as it is definite and understood, is rejected under 35 U.S.C. 103(a) as being unpatentable over either Liu 2002/0141863 or Sato 5,249,922. Liu (figures 1-5) or Sato (figures 1-3) disclose turbine blades 30/1 substantially as claimed as set forth above. In Liu, the rotor-side end is inclined with respect to the fluid flow direction at an angle of about 88 degrees,

and the rotor-side end is inclined at about a 65 degree angle between the stacking axis 50 and a tangent to the rotor side inner as seen in figure 3. In Sato, the rotor-side end is inclined with respect to the fluid flow direction at an angle of about 85 degrees. The rotor-side end is inclined at about a 65 degree angle between the leading edge and a tangent to the rotor side inner as seen in figure 2.

However, Liu or Sato do not disclose that the angle of inclination is 75 degrees.

The recitation of the angle of inclination of the rotor-side end is a matter of choice in design. The angle of inclination of the rotor-side end relative to the fluid flow direction of a turbine blade, and/or the angle of inclination of the rotor-side end relative to the delivery side of a turbine blade are result-effective variables which influence the turbine efficiency and performance. It would have been obvious at the time the invention was made to a person having ordinary skill in the art to select the angle of inclination of the rotor-side end relative to the fluid flow direction and/or the angle of inclination of the rotor-side end relative to the delivery side of the turbine blade in the turbine of Liu or Sato to be a specific value, such as 75 degrees, for the purpose of optimizing the turbine efficiency and performance, since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch*, 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher Verdier whose telephone number is (571) 272-4824. The examiner can normally be reached on Monday-Friday from 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Edward K. Look can be reached on (571) 272-4820. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christopher Verdier/
Primary Examiner, Art Unit 3745

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